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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Sixteenth Annual Meeting, Western Gas Association.

SECRETARY'S OFFICE, WESTERN GAS ASSOCIATION,
QUINCY, ILLS., April 10, 1893.

The Sixteenth Annual Meeting of the Western Gas Association will be held at Chicago, on the 17th, 18th and 19th days of May.

The Victoria Hotel will be used as the Association's headquarters, while the business sessions will be conducted in Kinsley's Hall, No. 105 Adams street. It will be recalled by many of our members that our meeting of '88 was held at Kinsley's, and that a more admirable assembly room for our purposes could hardly have been chosen.

While, as above indicated, the Victoria Hotel has been designated as headquarters of the Association, yet the great majority of our members will be compelled to seek accommodations elsewhere, as it has been found impossible to secure any one hotel which is able to provide for all in consequence of the great rush of visitors to the Columbian Exposition, at that time expected. However, there need be no fear on the part of our members as regards securing comfortable quarters and at reasonable prices, provided that rooms are engaged in advance. Rooms should be written for by the 1st day of May at the latest, and the writers should request acknowledgments of their applications from the hotel proprietors, so that there may be no possibility of failure in securing accommodations.

The Local Committee of Arrangements for the Chicago meeting consists of the following named gentlemen: Carl D. Bradley (Chairman), Chas. D. Hauk, A. S. Miller, John Stout, C. F. Bryant, F. K. Waugh, P. S. Dickey, S. S. Stratton, F. R. Persons, H. M. Hubbard, H. D. Harper and Chas. V. Newman. From this general committee the following have been appointed as a special committee on hotel accommodations: S. S. Stratton, A. S. Miller and Chas. V. Newman. The members of said special committee have canvassed the situation thoroughly and report that the following hotels have agreed to provide for the number of guests set opposite their respective names, and at prices as here stated:

Victoria.....	50 guests, at $2.00 to $5.00 per day.				
Great Northern...	50	"	"	2.00 per day and upwards.	
Gore's Hotel	50	"	"	1.50	" "
McCoy's Hotel...150		"	"	1.50	" "
Saratoga Hotel...150		"	"	1.00	" "

The hotels above named will be conducted on the European plan exclusively.

The Grand Pacific, operated on the American plan, will provide for 50 of our members, upon receipt of three weeks' notice, at prices ranging from $4 per day, upwards.

The Leland, conducted both upon the American and European plans, will accommodate at their regular rates a limited number of guests upon receiving timely notice from the applicants.

The Rossmore, Wabash avenue, between 18th and 19th streets, a new and finely equipped hotel, especially adapted to family requirements, will take care of 100 guests at their regular rates of $3 to $5 per day. The Rossmore is under the management of the Victoria, which would seem to be a guarantee of excellence.

While the following hotels do not guarantee to reserve accommo-

dations for our members upon receipt of applications, yet a limited number can probably secure rooms if the same are booked at once: The Auditorium, Palmer House and Tremont.

When making applications for quarters, members should write directly to the hotel proprietors and not to the committee on hotel accommodations, although if there is any special information desired beyond that stated in this notice, the members of the committee in question will gladly supply the same.

Further information regarding the papers which will be presented and matters pertaining both to the business and social features of the forthcoming meeting, etc., will be published in subsequent issues of the JOURNAL.

As it is expected that an unusually large number of applications for membership will be made on the occasion of our Sixteenth Annual Meeting, it is advised that the same be filed at an early day with the undersigned.

A. W. LITTLETON, Secretary.

QUINCY, ILLS., May 4, 1893.

The regular meeting of the Board of Directors will be held at the Victoria Hotel, at 10 o'clock, A. M., Tuesday, May 16th. The members of the Board are: F. M. Doan, J. M. Starr, W. L. Brown, D. Davis, R. R Dickey, James Montgomery, J. T. Lynn, J.W. Dunbar and H. D.Walbridge. It is hoped that the Directors will all be in attendance at the hour named, for some important matters are likely to come before them.

The business sessions will be commenced at 9:30 A. M. sharp, on the morning of Wednesday, May 17, in Kinsley's Hall.

The following papers will be presented at the Chicago meeting:

"Practical Gas Analysis, with Experimental Illustrations," by Mr. O. O. Thwing, St. Louis, Mo.

"On the Best Method of Construction of Oil or Naphtha Tanks for Storage Purposes," by Mr. F. D. Moses, Chicago, Ills.

"The Duties of Gas Companies to their Patrons," by Mr. H. D. Walbridge, Grand Rapids, Mich.

"The Relative Economies of Gas Engines and Electric Motors," by Mr. Jas. R. Smedberg, Chicago, Ills.

"Wrinkles," by Mr. Geo. T. Thompson, St. Louis, Mo.

"Residuals; Ideas Concerning Them Suggested by the Present Outlook," by Mr. James Ferrier, Columbus, Ga.

It will be noticed that the paper list has been somewhat shorn from its usual proportions. In explanation of this fact, it was deemed best by your Executive Committee that this should be done, for the reason that the World's Fair is apt to detract from the attendance at the business meetings, and its attractions may possibly prove so strong to a majority of our members that our usual two days' session may be abbreviated to such an extent that there will not be time for the reading and proper consideration of more than the five papers above enumerated.

In reply to inquiries received regarding transportation rates, I would say that in answer to my request to the railway authorities that the customary reduction of rates be granted, I have received word that on this occasion no reduction from the regular fares will be made, other than those which may happen to be in effect at the time from various points to parties in attendance upon the World's Columbian Exposition.

A complimentary banquet will be tendered to the Association at Kinsley's Hall, on the evening of Thursday, May 18th.

For application blanks, copies of by laws and detailed information not embodied in this notice, please apply to the undersigned.

A. W. LITTLETON, Secretary.

American Gas Light Association.

OFFICE OF THE SECRETARY, PROVIDENCE, R. I., April 19, 1893.

To all Members of the Council:

By direction of the President, I hereby give notice that there will be a meeting of the Council of this Association on May 16th, 1893, at 7.30 P. M., at the Victoria Hotel, Chicago, Ills.

Every member of the Council is urgently requested to be present, as the business to be transacted not only includes subjects concerning the October meeting of the Association, and the special features due to the time and place, but also other matters which are of vital importance to the welfare of the Association.

Respectfully,

A. B. SLATER, JR., Secretary.

BRIEFLY TOLD.

THE WESTERN'S MEETING.—Secretary Littleton, in his circular for this week, calls especial attention to the fact that the meeting of the Board of Directors of the Western Gas Association has been set for the morning of Tuesday, May 16th, and that the members thereof will hold their deliberations in the Victoria Hotel. Another addition to the circular is that which notes the calling to order of the first day's regular session at the rather early hour of 9:30 A. M. We presume the suggestion that important business matters will be brought before the Directors can be counted on to secure a full representation of the Board. Speaking generally of the prospects for the meeting, we have the privilege of writing that at the present moment everything looks most favorable for a grand attendance. There can be no doubt about it that the East will be well represented, and we can further say that at least one gas ambassador from Europe will be present, in the person of Herr von Oechelhauser, General Director of the Deutschen Continental Gas Gesellschaft, and who also is authorized to represent in this country before our Associations the German Association of Gas Works Engineers and Managers. We also have it on good authority that the French Association has deputed a delegate, but it is feared that he will not reach Chicago in time to participate in the meeting. The programme perfected by the Executives of the Association and the Commitee of Arrangements could not well be excelled, and every member ought to feel it his bounden duty to repay their efforts by answering in person to the call of the roll. The opening of the Fair last Monday has been told so well and widely that any mention of it here would be out of place; still it might do to note that the same was attended with marked success, in the presence of immense throngs, despite weather conditions about as inclement and uneven as could be experienced. The general verdict is that Chicago has done nobly, and that her successful efforts at putting together show palaces for exhibiting the industries of the world will hold the admiration of the world. While some confusion existed, and while undoubtedly the exhibition as a whole was not in anything like harmony on the opening day, the members of the Western Association and their guests no doubt will bear in mind that Chicago pluck and enterprise can accomplish much in a period covering 16 days. So it may be fairly held that a fair approach to harmony will have been made by the time the Western assembles at Kinsley's next week.

THE BOSTON GAS SITUATION.—We do not know that any particular good will be accomplished by any reference to the unsightly conditions prevailing for some time in the matter of the gas supply of Boston, where amazing "executive ability" has been displayed in profusion—on the part of the State Legislature, the city government, the Board of Gas and Electric Light Commissioners and the Gas Companies. It is, of course, easy to understand the motives that prompted interference on the part of the legislators; for said motives sprang from either cupidity or a desire for cheap and nasty glory—principally, we ourselves believe, the latter. It is a most regrettable fact that the Commission so easily swallowed the odd "concessions" offered the gas consumers by the Boston Gas Company, some time ago, for the concessions in reality did not concede much, and the Commissioners must have known that the movement for cheaper gas, which had its real inception at the time the Boston Company's controllers refused to renew some contracts with large consumers of gas, that had come to the Company as a legacy from the proprietors of the old Boston Company, when the latter was contesting for the supremacy of the gas field with Mr. Addicks and his associates, was backed by men of capital and pluck, who were not likely to cease their efforts until their point was gained. We must admit that the Board were somewhere betwixt the devil and the deep sea; still they might have taken to the water as well first as last. The most striking instance of illogicalness, however, is given by the proprietors of the Boston Company themselves, in refusing to renew the dollar gas contract with the influential hotel keepers, shop keepers, warehousemen, etc., when such contracts expired by limitation. Better that one should have bread and harmony than a slim prospect of shad roes and bacon, to be eaten, if at all, in a banqueting hall disturbed by noisy discontent; and it may be taken for granted that if the Addicks management had the thing to do over again, the bigwigs who had been getting their gas at a dollar would never have been told that the "contracts would not be renewed.

NOTES.—The death, on the morning of April 25, at his home in Louisville, Ky., of Mr. H. D. Fitch, is reported. Deceased was one of the originators of the scandalous opposition concern, known as the Citizens Gas Company, of Louisville, which was subsequently absorbed by the Louisville Gas Company. On his retirement from the Citizens Company, Mr. Fitch became largely interested in the gas business, holding controlling interests in several small Companies in Kentucky and adjoining States. These he managed in an eminently fair and business like way. He was in his 48th year, and leaves a wife and six children.—The proprietors of the West Chester (Pa.) Gas Company have reduced their sales rates to the following figures: For illumination, $1.50 per 1,000 cubic feet; for fuel and power, $1 per 1,000. Special contracts will also be made "with manufacturers and other large consumers of gas for fuel and motive power."

Inaugural Address before the Southwest of England District Association of Gas Managers.

By Mr. E. C. Riley.

My first duty is to tender my sincere thanks for the honor you have done me in electing such a comparatively young member of the Association to the important post of President. I should have preferred for some time longer to have occupied the position of a private member; but, since it has been your pleasure to confer upon me this mark of your confidence, I shall endeavor to do all I can to promote the objects for which I conceive the Association exists—viz., the consideration and discussion of both the principles and practice of the department of manufacture in which we are engaged.

Already this year, the Presidents of several District Associations have delivered inaugural addresses, which appear to have touched nearly every question of interest in modern gas manufacture; and it will be almost impossible to bring new features or fresh subjects before you today. I will not, however, assume that, like the ancient Athenians, you are ever thirsting to hear some new thing, but that what we really want is to consider the questions arising in the course of our own experience, and the advantages and disadvantages of methods, arrangements and appliances in the light of our own practice, in order that our views may be enlarged, modified or corrected by comparison with the experience of others. My own experience, as a Railway Gas Manager, lies in some respects in a different groove to most of those present, as the details of working both coal gas for general use, and oil gas for train lighting, particularly in distribution, are not in several respects the same as that of a company or local authority supplying the general public. Instead, therefore, of attempting a review of the gas industry generally during the last year, or an examination of the latest theories or departures in gas matters, I will content myself with looking at several features of our work as they have touched my own experience—a line so usefully taken up by Mr. Smith, of Smethwick, in his address to the Midland Association.

In many cases, the cost of the coal, before it finds its way into the retort, is much greater than it should be, owing to the question not having been considered in all its bearings. The mistake has perhaps originated in the site of the works, through want of care in its position in relation to water or railway, or neglect in taking full advantage of difference of levels in saving labor, and in the location of coal stores and stocks, so that the cost of second handling shall be reduced as much as possible. These site difficulties are, I think I ought to say, not always the fault of the engineer, as there are often many diverse influences and interests which affect this first and important step. This question of saving labor in handling both coal and coke is, I notice, receiving much attention from the great companies and corporations of our largest towns and cities, who are spending large sums in the provision of high level lines, conveyers and elevators; but I would venture to submit that, subject to the proportional and proper limits of expenditure, smaller works might find advantage from careful attention to these questions. In the largest works belonging to this [the Great Western Railway] Company at Swindon, in connection with an extension of the retort house made recently, inclined roads, carried on brick arches, have been laid up to the tops of the coal stores; so that hopper wagons may be used to drop the coal directly into its place without the intervention of the shovel. Also a deep dock or siding has been provided for loading the coke into the railway trucks direct. This is in connection with an arrangement of trolleys for receiving and loading the coke. Light tram lines have been laid close to, and parallel with, the front of the retort beds; the tops of the trolleys passing just under the middle row of mouthpieces—the bottoms being retained for supplying the furnaces. Two charges are drawn into each trolley each journey; and then they are pushed down to the end of the retort house, and stopped over drainage pits with water cranes above them. A valve, placed in a convenient position for the stoker's hand, enables the water to be turned on for a minute; and, when the coke is fully quenched, the trolley is pushed a few yards further to bring it exactly opposite the truck being filled, the scoop of the trolley is swung round, and the contents tipped into the railway truck ready for despatch to any point desired. We found a little difficulty at first in getting the men into the new arrangement, as we had to start it during the heavy make in November. I am, however, pleased to say that the arrangement works with perfect smoothness and comfort; and, if any difference exists in the time occupied in the work, it is in favor of the new arrangement. The retort house is designed for the adoption of machinery at any time in the future it may be considered desirable to provide it; and, when this is done, neither coal nor coke will be touched by the shovel from the time the coal arrives from the colliery until the coke is received in the truck at the place where it is to be finally consumed.

The question of condensation is one that merits, but does not always obtain, the amount of attention that its importance demands. By condensation, the whole influence of temperature on the gas between the retorts and the holder should be considered. The action of the hydraulic and foul mains in this respect has been brought prominently before this Association by our Secretary and others; but it is important that the influence of the other plant—such as scrubbers and washers, and even purifiers—should be taken carefully into consideration. My attention was called to this matter from the rapid growth of the same works I previously referred to, which, when first started about twelve years since, had an annual make of about 50 million cubic feet, but now has reached a make about treble that quantity. It will, of course, be obvious that extensions of plant have been necessary to meet increased requirements; the only part of the works untouched being the condensers. These are of the annular type, 2 feet 8 inches in diameter, with a surface area of 1,828 superficial feet; but the whole of this is not even now used in winter, as the central tube in one of the four columns is stopped—it being found that, with the lower scrubbers and washers, the condensation was quite rapid enough, even when the make was greatest, and during the severe frost, the temperature of the condensers was raised by steam pipes fixed temporarily. In Newbigging's "Handbook," the capacity for air condensers is given as from 5 to 10 superficial feet condensing area for every 1,000 cubic feet of gas per 24 hours of maximum make; while the capacity we have is not quite 3 feet, and, as we have provision for increasing the number of retorts, of course the proportion will be still less.

In looking into this matter, the temperatures were taken at various points; and the following table will illustrate my meaning. The table shows the effect of outside temperature varying from 20° to 88° F.

Table of Temperatures—Condensation of Coal Gas.

Outside Temp.	Foul Mains.		Condensers.			Scrubbers.				Washer.		Meter.
	No. 1.	No. 2.	Inlet.	No. 3.	Outlet	Inlet. No. 1.	Outlet. No 1.	Inlet. No. 2.	Outlet No. 2.	Inlet.	Outlet.	Inlet.
Fahr.	Fahr.	Fahr.	Fahr.	Fahr.	Fahr	Fahr.	Fahr.	Fahr.	Fahr.	Fahr.	Fahr.	Fahr.
20°	—	100°	90°	70°	58°	66°	52°	52°	46°	54°	32°	43°
22	—	98	90	68	58	66	52	52	46	66	34	42
28	—	100	94	80	64	66	52	52	44	68	44	42
30	—	110	100	84	76	74	54	54	46	68	44	42
32	—	116	100	86	82	82	62	62	50	70	52	46
34	—	122	106	90	86	84	65	64	52	70	50	44
36	—	120	108	90	88	88	66	66	54	54	40	44
38	—	122	114	92	80	82	64	66	56	56	44	46
40	114°	108	104	88	76	82	72	74	66	70	56	54
42	116	112	106	84	70	78	64	66	58	66	54	58
44	118	110	102	78	64	73	58	61	54	58	46	51
46	115	112	106	85	70	77	66	68	61	68	54	61
48	104	95	86	62	52	64	51	56	47	53	44	52
50	135	130	120	90	76	82	66	68	62	66	56	58
54	130	120	112	86	74	80	68	70	64	70	62	59
58	116	112	104	87	73	86	67	70	63	66	58	60
60	124	120	112	96	84	88	76	78	70	74	64	62
64	128	122	104	80	67	78	68	72	66	70	64	62
68	106	106	96	79	66	78	66	68	62	65	56	64
70	130	120	108	84	70	80	70	72	70	73	63	62
72	126	126	111	96	87	90	78	81	78	80	74	65
74	124	123	110	80	70	76	70	72	70	70	68	65
76	124	122	115	92	84	87	80	83	82	84	74	65
78	124	122	113	92	81	17	79	82	76	79	82	64
80	122	122	119	104	95	93	86	88	88	87	81	64
84	132	132	120	113	95	96	86	88	83	85	79	69
86	135	132	118	100	90	92	85	84	86	88	81	67
88	132	132	120	113	95	95	86	88	83	85	79	69

This illustration seems to point to the probability that, in many cases, the open air condensers are frequently too large altogether, or at any rate in winter, and that increased length and area would be desirable in the foul main, and provision for reducing the area of the outside condensers in cold weather, in order to ensure more uniform results.

So much has been written and said on the question of purification recently, that the only allusion I shall make to the subject is to ask if the restrictions imposed as to the presence of sulphur in minute quantities is of sufficient disadvantage that the expense of its removal is worth to the consumer the amount of the additional cost of the gas. This question is finding a place in many minds, and has found an audible voice in the bill promoted by the Crystal Palace Gas Company, who ask for a limit to be 30 grains per 100 cubic feet, instead of 17 and 22 grains; and if this question can be raised in a district like that served by the Company referred to, with important residential areas, how much more unnecessary do the restrictions appear in the case of poor or manufacturing neighborhoods or cheap business quarters, where so much gas

is used for outside lighting, cooking, motive power, or manufacturing and industrial processes.

With reference to the subject of gasholder construction, it may be interesting to members to mention that the two-lift holder erected by this Company at their Swindon gas works about three years ago, with guide framing to the lower lift only, has given no trouble whatever; and its behavior in the roughest weather is ample evidence as to its stability.

In the consumption of gas, the field of useful application is a very large one. A convenient arrangement for warming meter and governor houses in very small works where no steam was available, we have found to be a very simple gas heated boiler, with circulating pipes. This, with a small consumption of gas, has proved an excellent precaution against frost, with the minimum of attention or labor. In the important department of this Company, which is under the control and direction of Mr. Dean, of Swindon—I mean the locomotive and carriage department (of which the gas department is only a very small section)—not only at Swindon, but over the whole system, which embraces the greatest extent of mileage of any railway in the kingdom, gas is made to do useful service in many quiet and unsuspected places. The water cranes, which are so exposed to the influence of frost in severe weather, are frequently, where gas is available, kept from freezing by jets in out-of-the-way places underneath. Gas also is a useful servant in burning off paint; in providing clean and steady fires for lamp makers and tinmen; in heating tyre furnaces, not only for taking off and putting on carriage and wagon tyres, but the large and heavy locomotive tyres up to 8 feet in diameter; rivet heating furnaces, and various applications of the bunsen burner, are found rendering useful service in various departments; while, in the foundry of our large works at Swindon, the core drying ovens, 24 feet long, are heated by an arrangement of gas burners, which takes the place of furnaces and heating flues—the principal advantages being the greater facility for obtaining an entirely uniform temperature, the saving of labor attending to furnaces, as well as of labor and material for the repairs and maintenance of the same. Gas engines are also beginning to take their place alongside the steam engine in the provision of motive power.

In oil gas manufacture, this Company, in common with most of the leading railways of the country, are rapidly increasing their provision for the manufacture, compression and storage of oil gas at various selected stations on their system, in order to provide for the supply of the constantly growing number of carriages fitted with gas apparatus and lamps. A variety of burners are also receiving attention; and the mushroom shaped regenerative burner is competing for a share of the public favor with its formidable flat flame rival. On the Continent of Europe, in America and India, oil gas train lighting is already making considerable progress; and with the facilities of intercourse now existing, we may be sure that Australasia and even Africa will soon follow.

In the field of general lighting, great possibilities are opened up in study and investigation of substances and appliances for incandescent gas lighting. Mr. Leicester Greville, in his most suggestive paper in the *Journal of Gas Lighting* for January 24 last, points out that the high result obtained in testing the Welsbach lamp, was given equally when the normal illuminating power of the gas was reduced to about one-third its original value; and if we are to compete with the prophesied full development of electric lighting which Mr. W H. Preece announces is to equal gas at 2d. per 1,000 cubic feet, it seems to me this is, as far as present indications allow us to judge, the direction in which we must look. The competition in regenerative high power lamps will tend to lessen their cost, develop further improvements, and bring them more within the reach of ordinary consumers.

Turning aside from the appliances either for the manufacture or consumption of gas to the relationship between the gas companies and their managers, and the men they employ, I think the gas industry, as well as the manufacturing world generally, have been laid under a deep debt of gratitude to Mr. George Livesey by the battle fought and won for the right of employers to freedom of arrangement with their own men without outside intimidation or dictation, while at the same time he has been laboring, by statesmanlike measures, to bring about permanently improved relationship between the workers and those they serve, by giving them a personal financial interest in the success of the undertaking in which they are engaged. This is not only useful in removing friction and promoting good feeling, but is a practical development of a principle that seems to afford the most valuable and satisfactory common ground of interest for capital and labor; and in the spirit of unrest that obtains in many quarters, and the influence that can now be brought to bear upon legislation by the rank and file of labor, this great plan of profit sharing, built on the foundation of community of interest and mutual benefit, appears to point the way to amicable and satisfactory lines on which many of the labor problems of the future may be solved, and without aiming at the impossible Utopia of clever writers like the author of "Looking Backward," a state of things may be realized in which even the humblest toiler will have some proportional share in the prosperity of the undertaking in which he is engaged. The more this principle can be carried out in the industrial world, the greater the probability of avoiding the rude and objectionable form of contest, unfortunately so familiar under the term "strike," which could, with advantage to all, be relegated to the pages of history along with the feudal system of past ages.

Ever since I have had any opportunity of knowing anything of the working of the various Institutions and Associations connected with the gas making interests of the country, I have been much impressed with the view that there is a want of general co operation for practical purposes in the interests of progressive development, and a lack of that united concentration of experience and ability, for purposes of research or recommendation in reference to new processes and appliances, which ought certainly to be available. Briefly, what I think is needed, and is within the possibilities of practical politics, is a federation of the various societies on some basis which will practically leave untouched the organization and control of each separate Association, but provide a central representative body formed of chosen representatives from each, which will necessarily be the natural and official voice of the gas manufacturing interest and skill of the country, and shall be able to provide such a powerful Committee of Research or Reference that to them subjects which the industry at large would desire to see more fully investigated might be referred—such as the relative value and cost of ordinary and regenerative firing, of various types of retorts and settings, of air and oxygen purification, of various classes of lamps and burners, the standard light unit, and the existing regulations governing the quality and manufacture of gas.

I fear this simple fact is lost sight of—that by far the majority of gas undertakings are, after all, what would be called small, and in these the directors, committee, engineers or managers have not the power or opportunity of spending large amounts in experiments, and naturally would choose a policy of waiting rather than attempt what might be regarded as a doubtful experiment, which might possibly interfere with the power of paying the usual dividend; and even when perhaps a majority in the management were prepared to take a new departure in the provision of more modern plant or recent development of some new system of working, the conflicting statements of the promoters of rival firms interested in the working of the new method or plant, so perplex and confuse, that the result is a rejection of both. If, in circumstance of this kind, the disputed question had been before the Research or Investigation Committee of the Council of the Federated Gas Associations, the report of such a Committee would be a guide that, amid the babel of conflicting opinions, would be respectfully esteemed and regarded as a counsel of safety. I am satisfied that new and improved methods and appliances would be adopted with greater rapidity, and with more general advantage to the industry at large, under a system such as I have sketched. In addition, what I may venture to call partial discoveries might be followed up, and reliable data obtained as to the value or possibility of the new appliance or method, without the loss of time to the country in waiting for some one or other to find time or opportunity to take the matter further.

I have not taken up this subject without some practical acquaintance with the possibilities of federated usefulness, as, in another sphere of associated effort, I know a federation of associations differing very widely indeed in their constitution, organization, and methods of work, and yet having one general underlying agreement. They are by this means able to meet and carry out many matters of general interest that could not be dealt with by individual Associations, and also formulate recommendations and give expressions of opinion that are generally valued and usually gladly acted upon; and this knowledge makes me hopeful that the gas industry may yet be able to move on the same lines. The desirability of this has been referred to on many occasions by presidents and members of our various Associations. Our last President (Mr. Irving) urged its importance; and Mr. C. C. Carpenter, at the last Southern District meeting, alluded to a paper read on the subject by Mr. Addicks, of the American Gas Light Association, and suggested that we might take "the wind out of the sails" of our Yankee brethren by bringing about a federation in this year of grace 1893. As a practical step, the Committee of this Association have decided to bring before you two resolutions that will be submitted by Mr. Irving, which I trust will receive the friendly support not only of this meeting, but also that of other Associations. The scheme so drafted is to be sent to each soci-

ety or Association for its consideration, amendment or approval. If this scheme is received and considered generally with a sincere desire for united action, there need be no real barrier; and at any rate, the year 1894 would witness this welcome addition to our usefulness, and a greater sympathy and unity obtaining among the gas engineers and corporations of the country.

I would now bring my remarks to a close by giving a few particulars as to the oil gas works you have just been inspecting. When the Great Western Railway Company decided to commence the manufacture of oil gas, the battle was raging between the Pintsch and Pope systems, and, like the London and Northwestern Railway Company, the Directors obtained their first plant from Messrs. Pope & Son, of Slough. This firm erected a bench of 6-inch cast iron D-retorts, 4-inch pipe condensers, 2-foot 6-inch brick scrubber, a small low pressure holder of 1,000 cubic feet capacity, and four high pressure reservoirs of 270 cubic feet capacity each, or a total of 1,080 cubic feet. By the year 1887 the make of gas averaged over 40,000 cubic feet per week, and occasionally reaching 60,000 cubic feet per week. At this time the consumption began to increase at a rapid rate, and extensions had to be made, in order to provide the increased quantity required. A new bench of retorts was built, and the size was increased to 8 inches, and the length increased by 1 foot. The old bench was then pulled down, and two new benches of 8-inch retorts erected, providing 18 pairs of retorts in all. New cast iron condensers consisting of five hollow cast iron columns, 18 inches diameter, standing over a long brick and cement seal tank, an additional dry scrubber, 4 feet diameter, and an additional holder of 2,000 cubic feet capacity, also nine more high pressure reservoirs have been fixed, giving an increase of 2,430 cubic feet storage for high pressure gas. We are now preparing to fix a reservoir over 7 feet diameter by 25 feet long over all, and 920 cubic feet normal capacity.

The compressing has hitherto been effected by three engines of the type originally made by Messrs. Pope & Son, with 6 inch pumps and 10-inch steam cylinders, 16 inch stroke. These compressors are now being replaced by larger and more powerful engines made at Swindon under the direction of the Chief Engineer (Mr. W. Dean). The pumps are 9 inches diameter, and the steam cylinders 15 inches diameter, with 24-inch stroke.

The gas is conveyed by mains ¾ inch inside diameter through the various sidings and carriage sheds at West London, where the trains are cleaned, gassed and formed ready for use, and are already laid about half the way to Paddington Station for supplying various sidings, etc., *en route;* ground or filling valves being provided at all points considered necessary. The hydrocarbon deposited during the compression of the gas is of a very inflammable nature, and flashes at ordinary temperatures. In order to ensure safety in dealing with this, a small tank, of the same strength as the high pressure reservoirs, is placed under ground, into which the hydrocarbon from the reservoirs is drawn as required; and when it has to be filled into iron drums for despatch, it is conveyed some distance in a pipe laid underground to a shallow brick pit, where the drums stand for filling. This work is only done in daylight. The storage and handling arrangements are under the license and approval of the Inspector of the London County Council. The make of gas about last Christmas time nearly reached 300,000 cubic feet consuming over 4,000 gallons of oil. Our oil supply is kept in tanks underground; and we have storage for 7,000 gallons.

The fuel used for heating the retorts is coal. The only product in the manufacture of oil gas, besides the hydrocarbon, is the tar, which is not a generally marketable commodity. We have, therefore, adopted the plan of burning it for fuel, with a steam spray injector, which answers our purpose very well. We have had one special difficulty to contend with, which, in the recent stringent regulations adopted by many local authorities, other manufacturers of oil, or even coal gas, may have to face. We received complaints of nuisance from smell arising from the drains, into which the drainage from the gas works was delivered, and were called upon to make our effluent water absolutely inodorous, or deal with the matter in some other way. I will not dwell upon the various schemes that were considered, such as filter beds, settling tanks, etc.; but eventually an arrangement was adopted which has met with the approval of the local authorities and has enabled us to deal entirely with our own drainage water, and absolutely sever and concrete up our connection with the London drainage system. Our arrangement is this: Two large iron cylinders or tanks have been sunk into the ground, side by side, into one of which the drainage is allowed to run. About 4 feet from the bottom is a pipe connecting the two cylinders together, so that, when the water is 4 feet deep in the first cylinder into which the drainage flows, it runs into the other cylinder in which the suction pipe of the steam pump is placed. An overhead tank, in two divisions to allow for cleaning, is also provided some distance away; and, at regular periods as may be required, according to circumstances, the pumps are set to work, and the drainage water is delivered into the high level tank, which it reaches by an open trough channel, so as to obtain the assistance of the oxidizing action of the atmosphere. On reaching the tank, this water is mixed with an additional supply, to make up for what is used by evaporation in the steam boilers of the works; but the smell is neutralized by the addition of finely crushed permanganate of potash, placed in equal proportions in each of the cylinders and tanks, with the result that, at comparatively small cost, we have succeeded in overcoming what seemed a serious difficulty, and been enabled to comply with what many would consider unnecessarily harsh and stringent regulations. At any rate, we have found a way to meet the high standard of efficiency which is being demanded of manufacturers in the avoidance of nuisance, or of anything tending to interfere with the comfort and efficiency of the modern systems of sanitary science and hygienic conditions of life; and I think that, with the tendency of the times, any improvement that can be made in this direction is worth the attention of gas manufacturers, as well as managers of any other works, against which a charge of nuisance can possibly lie.

I trust that the further opportunities we are to be privileged with in the way of inspection of a modern works, with many specialties in plant and methods, may be found exceedingly interesting and instructive.

Coke.

By Mr. Jones Wister, of Philadelphia.

The making of coke is a thrice told tale to those who live in soft coal districts, but we who live in the East and who use anthracite in our houses know almost nothing of soft coal and coking of it. Yet in our factories and blacksmith shops we thoroughly know its uses.

Almost every child knows the difference between hard and soft coal, and that is about all he cares to know. If the housekeeper desires to try soft coal in the grate he is met by various excuses as to why it cannot be done with satisfaction and economy. But after persistence he has the satisfaction of sitting before a beautiful glowing fire which warms and satisfies. After awhile the fire needs poking, and he discovers a substance different from the old familiar clinker, but hard and glowing. He has had his warmth and comfort, and has found something in his grate which he did not buy. He has, perhaps, unintentionally, been baking coke.

Coke is cake made from bituminous coal instead of flour. The cake made from flour is light and cellular from the same causes that coke, made from soft coal, is honey combed and not compact.

The ovens in both operations are almost alike in construction, with slight modifications to suit the different uses. But the resulting cake becomes cake from the same causes. The slow escape of the gases under pressure of heat and the weight of the overlaying mass separates the dough in the one and the body of the pasty coal in the other. The gluten of the flour and the bitumen of the coal performing the duty of binding the cells at the point of contact, forming the entire structure into a cake.

Here, unfortunately, the resemblance ceases, for man has devised most effective methods to deprive flour of its vital principles, the phosphates and nitrates, which he feeds to the lower animals, while he eats the starch, fat and sugar. But when he seeks a fuel he is actuated by motives of wealth instead of health. He retains the bitumen, for without it his coke becomes dust or ashes.

While the standard coke for furnace use is hard and solid, it would seem that a coke of less specific gravity might be advantageously used in the cupola. The blast furnace of to day is 70 to 80 feet high, while cupolas range from 10 to 15. This difference may mean much to the foundryman. A 24 hour coke would seem better suited to his use than a 72-hour coke. But caution in such experiments is suggested. It must not be forgotten that charcoal is the ideal fuel and that coke is the best imitation yet produced. But hard coke, when hard burned, approaches anthracite in solidity, which is the important object for blast furnace use.

For quick combustion before tuyeres discharging air under a pressure of only 8 to 10 ounces, it seems highly probable that standard 72-hour coke is too compact and too much like anthracite in its nature to produce the best results in the cupola.

An atmosphere obscured by dense smoke notifies the traveler that he has reached the coke region. This smoke is the unnecessary waste, and is the constant companion of the coke baker of America, chiefly because a notion has long prevailed in the iron trade that coke made in

any other oven than the beehive is unsuited for blast-furnace use. Closed ovens have been operated with perfect success in Europe for many years, and are slowly being adopted in America, though sinful waste is still the rule. The utilitarian concocts a scheme while passing through the coking territory by which he will save the escaping gases for purposes of illumination, which might, if put into practice in a business-like way, be successful. But he soon forgets the passing thought, and the waste, like the brook, goes on forever. When it is remembered that 10 to 12 gallons of coal tar can be distilled from every ton of such coal as is ordinarily used for coking, it is readily seen that the waste resulting from the coking of several millions of tons a year must amount to an enormous total.

Approaching the ovens, it becomes manifest that notwithstanding the great waste a large proportion of the original charge of coal remains after the volatile has passed off, which is the coke. The oven had been full to the top before firing, but two days' subjection to a high heat has reduced its dimensions about three quarters, though its weight has suffered only about one-third. The resulting coke varies from 60 to 80 per cent. in different coals under similar conditions, while different processes also have a still greater bearing upon the results.

The so-called closed oven, in contradistinction to the open or beehive, is a foreign invention. It has been the means of saving much of the waste characteristic of the American system. Dr. John Percy says of the Appolt oven: "It appears completely to fulfill the conditions of a close vessel retort."

The investors claim that, although costly, it yields more coke per charge than any other oven, as compared with the cost.

This brings me to ask, Whence this increased yield? In my address before your body on the evening of Feb. 1, I said that if bitumen exists in a coking coal in larger quantities than that demanded for coking the mass, it remains within and permeates it, and itself burns into a coke of a character much more solid and compact than coke made from low volatile coals.

My claim, stated briefly, is that the increase of yield is the result of the formation of coke from the bitumen or volatile. A scientific friend discredited the theory, and he has since written fully confirming his views.

My friend quotes from Dr. Percy, who is a most careful and exhaustive writer. But Percy wrote in 1875, which was before Professor Church demonstrated that the cellular construction of coke and charcoal gave them their great value and efficiency. Percy calls coke a solid product, and in one sense it may be so called. But he would no doubt use the word "cellular" if he were to re-write the definition. Dr. Percy has studied coke so fully that my friend has a most satisfactory backer, but the doctor says, on page 429 of his work on fuel, that at the conclusion of the process of coking in rectangular kilns, an accumulation of tarry matter always occurs immediately under the coal at the top of the kiln, which would further tend to prevent the descent of air from above as well as the ascent of currents from below, and it is there that the most solid coke is produced. It is not a fair inference that the solidity is produced by the coking of the tar or bitumen when this solidity occurs in its immediate neighborhood.

At the Montreal meeting of the American Institute of Mining Engineers, a paper* was read by J. D. Pennock, of Syracuse, N. Y. Quoting from Watson Smith, he says that he believes that during the escape of the tar vapors from the decomposing mass, a portion of these must suffer complete coking, the pores of the mass becoming thus filled up, whereby the yield of the coke is increased and greater solidity obtained.

When it is remembered that these tar vapors will coke a given amount of anthracite or other dry culm, and further, that after distillation they deposit upon the walls of the retort and become baked into a coke so hard and tough that the use of a sledge is required to fracture it, there is much reason in the claim that the tar or tar vapor solidifies and becomes coke.

[From the *Gas World*.]

Gas Works as Lighting, Heating and Power Centers.

[An address by Herr W. Oechelhauser before the Prussian Association for the Promotion of Industry; abstract.]

We are now celebrating the centenary of gas lighting, due to the genius of William Murdoch, to whom Scotland lately did honor. [Here Herr Oechelhauser gave a very full and appreciative sketch of Murdoch, based upon his biography.] Murdoch's genius was so great that he devised in a practical form the apparatus necessary for gas works in a form which remains in essential respects that which we use to-day. But improvement followed upon improvement, and when we come to the year 1878 we find that the internal development of the gas industry had kept pace with the external demands upon it, great as these had been.

In the year 1879 Friedrich Siemens, of Dresden, brought before this Association his first regenerative gas burner, very shortly after the electric light had presented itself as a practical competitor with gas. During the following years very great progress was made in this field, with the intensive lamps of Siemens, Wenham, Butzke, Schulke and others. At the same time, street lamps often remain very much in the state in which they were 30 years ago; partly because of the low price paid for public lighting gas, and partly because of the practice of spending any surpluses from town gas works upon matters other than those relating to public lighting. This is not the fault of the gas industry, which can supply a great deal more light. Perhaps the Welsbach lamp will help in this. The electric light is really a great stimulus in this direction.

Water gas, too, has been a fertile and interesting theme during recent years, and America has been pointed to as an example; but the conditions in America are the reverse of those obtaining in Germany. There, there is plenty of anthracite, but no gas coal; they have plenty of petroleum at hand, while ours has to be imported and to pay an import duty. For central stations, carbureted water gas will not work in this country under present conditions.

Then, again, we are told that we ought to give up the attempt to compete in the lighting field, and ought to restrict ourselves to supplying a cheap heating gas. But any such gas has, in fact, only about half the heating power of coal gas, and when distributed through sufficiently large mains, it would not be so very cheap. Besides, the capital already sunk in coal gas plant could not be sacrificed without a struggle, especially as experience has now taught us how to use coal gas to the best advantage; and it is not likely that permission could be obtained to use the streets for a double set of mains. The American Gas Light Journal, 13th June, 1892, gives some very interesting particulars as to the necessity of selling heating gas at so much lower a price than that of coal gas that it would not pay; and I believe there is now only one company in the United States, at Chicago, which makes the attempt. The variations in the demand for heating gas are found to be extreme; and this stands very much in the way of central station working, for extensive gasholder accommodation becomes necessary. It is out of the question to expect to do all heating by means of heating gas; and it is better, at any rate, to wait for the American results, that is, for the Chicago Exhibition, before entering upon any change of system.

Heating Stations.—Coal gas can perfectly deal with a l those cases in which it is rational to work upon a central station at all. An inquiry made by the German Gas Association in 1890 elicited the result that gas was used for heating purposes in 135 industries. In Denmark, more of the gas from the mains is used for heating than for lighting; and in Tilsit, in Germany, this is nearly the case. It is clearly found to have been a mistake to imagine that the price is the only element to consider. Difficulties in getting apparatus are of much more importance; and so are questions as to easy manipulation and economy in use. The energy of the gas companies is as important as the price of their gas. It is often contended that central stations can be far best managed as municipal undertakings. Against this, we know how the German Continental Gas Company took the lead in encouraging heating by gas, by means of discounts from 25 to 30 per cent., as far back as the year 1868. They also gave every possible facility for procuring apparatus. The first municipal undertaking to follow this lead was that of Dusseldorf, in 1886.

The smoke question has been taken up by our Minister of Trade; good results may follow. We cannot hope that central gas stations will prove a cure-all; but great good may be done by using gas and its bye-product, coke. This would allow works to be put up within towns. Just as it would not occur to anybody to gasify petroleum and convey the gas by pipes, since every one has at hand his own best gasifier in the shape of his petroleum lamp, so the gasification of coke at a central station cannot compete with those "Irish" coke stoves which are to be found everywhere; and when the coke comes in bags from the gas works, the heating is clean and convenient, and about as free from smoke as it would have been if carried on by means of gas. It is the case that the less well off part of the middle class has been the most ready to avail itself of the advantages of gas heating. In such cases, the wife attends to her own kitchen; and it is not absolutely the price of gas alone that determines the choice; for the cleanliness and comfort secured are als greatly looked to. There is no greater mistake than to suppose that gas heating is only for the rich; experience tells a different story. Gas stoves are generally used as a supplementary means of heating, or for rooms which have seldom to be heated up, but then

*See Journal, issues of March 20, 27.

quickly. Gas is very much more used in industry than is thought, and sometimes its use is even kept a trade secret. In many cases it is utilized for securing uniformity of temperature. A recent application of this is in steel tempering. For all such small scale cases, gas, at present prices, is effective and satisfactory. The supply of gaseous fuel to manufactories is a different matter, and one beyond the sphere of a gas works.

Power Stations.—The distribution of power, or rather of fuel, from gas works has not made as much progress as it should have done. The practice goes as far back as 25 years ago. There seems to have been, two years ago, about 18,000 gas motors in Germany, with an aggregate horse power of about 60,000. To these we have to add the turn-out during the last two years, amounting for the two greatest manufactories alone to 1,950 motors, of 8,830 horse power. At the beginning of 1892 there were in Prussia alone 69,087 steam horse power occupied in driving dynamos. It must, at the time, be remembered that it is only recently that gas has been cheap enough to enable gas motors to be pushed. The state of the gas motor industry is a thing for Germany to be proud of. The Lenoir machine of 1861 used 123.5 cubic feet per horse power per hour; the present motors use 28, or in large sizes 23.75; so that a 16-candle incandescent lamp can now be kept going at an expense of 21.2 cubic feet of gas. And this consumption is not the consumption at full load, as it is usually reckoned for steam engines and electrometers, but the average consumption for all loads; and it may be expected to be reduced very soon, when we get motors of 500-horse power, to 17.6 cubic feet of 16 candle gas per horse power per hour.

But how is it with the supply pipe system? Can gas companies supply enough gas? Would it pay? Berlin could supply 118,000 horse power, Beckton, 120,000; with a loss through driving power of about 0.08 per cent. No other system can come near this in economy of transmission. The stream of energy is steady; and there is an ample reserve. The present Berlin gasholders could maintain 93,000 horse power for ten hours: Beckton, half a million for the same time. An electric accumulator battery, delivering 560 horse power hours, costs £3,500. A gasholder, considered as a store for power, would cost at a rate from one-seventh to one-fiftieth of this amount. No other system can compare with this in economy.

The cost of mains, under the German Continental Gas Company, with an average of one burner per 80 inches, is 16s. per burner. For electric mains it is reckoned as 50s. For alternating currents it is usually reckoned at 30s. per lamp. Data are wanting as to pure transmission of power by electricity, but the cost of mains for electric transmission seems to range from 4 to 6.7 times that of the corresponding gas mains. The loss of gas on the way, due to leakage, condensation, measurement by cold meters, imperfectly measured public gas supply, and conceivably a certain amount of diffusion through the iron pipes, is in Germany from 2.5 to 7 per cent., with an average, in the German Continental Company's working, of 4.4 per cent. The wider the mains the better the result. This, again, is far in advance of other systems, though data are sadly wanting as to the incidental losses in compressed air and electricity. In cases where it would not pay to bring gas from a distance, Dowson apparatus could be put up, and the broken washed coke used in it, with very economical results. On the other hand, gas is not to be got everywhere. Sometimes it is very dear; and for some purposes the compressed air or the electric motor is better than the gas motor. Herr Junkers has devised a convenient calorimeter for ascertaining the heating value of gas; and it is to be hoped that motor makers will soon specify their machines in terms of units of heat, and not of cubic feet of gas, which are wanting in definiteness.

Lighting Stations.—The last few years have really answered the question whether gas is to be superseded by the incandescent electric lamp. Both systems develop quietly side by side. But gas has entered upon a new epoch with the advent of the Welsbach lamp; and at the same time the views of those who have been partly justified who recommend that gas works should be restricted to the making of heating gas; for the essential requirement of the new system of lighting is heating gas for the Welsbach bunsen burner. Instead of self-luminosity we have the incandescence of a foreign object. The transformation of energy into as much light with as little heat as possible is the practical problem of the day. The old gas flame wasted as much as 99 per cent. of its energy in the form of heat; and at the other extreme stood the glow-worm, with its waste of only ¼ per cent. in that way. The Welsbach lamp is a step toward the glow worm, and its "light without heat." Dr. Auer v. Welsbach's discovery was an outgrowth of his long continued experiments upon the preparation of the pure rare earths, and was at first intended to be applied in connection with water gas. But it turns out that it does not work well with water gas, for the hood undergoes chemical changes. The new lamp has faults, which were carefully gone into by Herr Fahndrich at Kiel; but in spite of these it is making its way very rapidly. It is bright, cool, and economical in gas. Where a gas flame used to emit 900 calories for a 16 candle jet, the new lamp gives 500 calories for a 50 candle light. An electric glow lamp of the same brightness emits 46 calories. The products of combustion fall to one-fifth for equal lighting power.

With Dessau gas, 13.5 amyl-acetate units for 5.5 cubic feet, the best of effect was obtained with 4 cubic feet per hour, at 1.6 inch pressure. The power was then 74 candles. The durability of the hoods is found to be very great—2,400 hours in the German Continental Company's experiments. After 500 hours the fall-off in lighting power becomes very slow. For every twenty-fifth of an inch rise in pressure the lighting power rose by about one candle. An equal gas consumption at an enhanced pressure increases instead of diminishes the life of the lamp, as has been believed to be the case. The manufacture of the hoods is making rapid strides, especially in respect of permanence in the lighting power.

Welsbach lamps differ from one another to about the same extent as electric glow lamps do. Of 14 Welsbach lamps, 3 gave way after 1,170, 1,950, and 2,340 hours. Of 20 electric lamps, 8 gave way between 59 and 533 hours; and out of 10, 4 gave way by short circuiting. The fall-off in lighting power is half as rapid in proportion in the Welsbachs as it is in the electric lamps. Pintsch, of Berlin, has devised a satisfactory lantern arrangement by which the Welsbach can be used for street lighting. If the Welsbachs come much into use, gas companies may be able to make an ordinary gas of from 5,200 to 5,600 calories per cubic meter, or, say, 14 to 15 candles, for all three purposes, heating, motors, and incandescent gas lighting.

Just as it has been found necessary at Buffalo to resort rather to the actual water of Niagara Falls than to the energy conveyed along wires to a distance, so the gas industry will be able to accomplish its aims by transporting not power, but actual fuel, and that in a convenient form, and with a minimum of loss; and it will thus be able to supply both light, heat, and motive power.

The Miller Zig-Zag Reversible Gas System.

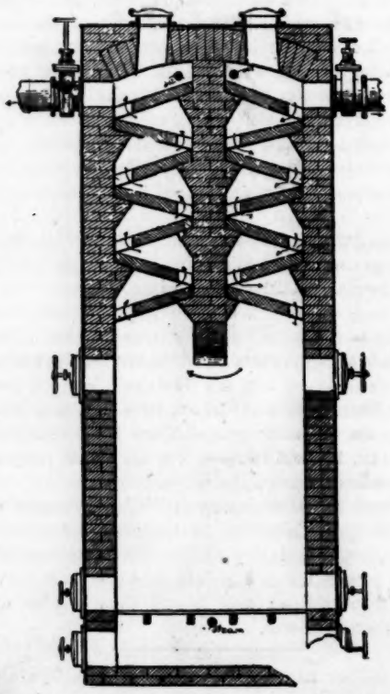
The *Am. Manufacturer* notes that during the past few weeks considerable attention has been paid to a new water gas system now being tried at McKeesport, Pa. An experimental plant located on the grounds of the City Gas Company, at McKeesport, has been visited by representatives of various fuel gas companies, whose supply of the natural fuel is running out. This is called "the zig zag reversible" system, and is the invention of John H. Miller, Jr., of Galion, O. The specification states that this improved water gas generator for the manufacture of either heating or lighting gas by the decomposition of steam and oil, is of simple and practical construction, easily and economically operated, and very effective in producing a large volume and good quality of fixed gas, without being fouled by deposits of carbon. We give herewith a sectional view of the generator used in this process.

The generator is preferably made of rectangular cross section of about 8 by 10 feet and 21 feet high, which dimensions have a capacity of producing about 20,000 feet of gas per hour. It is constructed with an outer steel shell, ½ inch thick, and a lining of firebrick. In the upper half of the generator the firebricks of the lining are corbelled out at intervals to form shoulders which afford supports on the side walls for baffle plates. The upper half of the generator is also divided vertically into two compartments by a partition wall of firebrick, which is carried upon an arched saddle tile supported in the side walls at its ends, or it may be upon a brick arch. This partition wall extends to the roof and at points between the shoulders of the side wall its brickwork is corbelled out to form shoulders that constitute the inner supports for the baffle plates. These plates are constructed of fireclay tiles and are placed upon the shoulders and in the two chambers and in zig zag arrangements, one above another, in inclined position, and with the opening at the lower end, the lower edge of one tile resting upon the upper edge of the one below it.

In the upper end of each chamber there are draft outlets provided with dampers for the escape of smoke and the heat products of combustion, temporarily. In the upper end of the same chambers, but opening through the sides of the generator, are outlets through which the gas is allowed to pass off into the hydraulic seal. In the top of each chamber there are also inlet pipes for introducing oil which is put in by steam injectors in the usual way. In the sides of the generator and just below the partition wall there are doors through which the coke is charged into the chamber which occupies the lower half of the genera-

tor. Doors for the removal of clinkers and ashes are provided, and a pipe enters the generator below the grate bar, through which steam is introduced below the mass of incandescent coke to be decomposed, and furnish the necessary element, hydrogen, for the synthesis of composition of the fixed gas.

The operation of the generator is as follows: In first firing up, a quantity of wood is placed on the grate and ignited to set fire to the coke



ZIG-ZAG GAS GENERATOR.—Vertical section.

which is charged through the doors into the chamber, but after the generator is once heated it maintains its heat and the fuel that is alternately charged is ignited without kindling. In firing up, the dampers are opened and the outlet valves are closed. Coke is then charged into chamber and is ignited either by the kindling or by the heat of the generator, and the smoke and hot gases pass upwardly through the chambers and out as from a chimney. When the generator is sufficiently heated the dampers are closed, and one of the outlet valves being opened, oil is introduced at the top through a pipe and trickles down over the hot baffle plates, while the steam introduced below the grate rises through the incandescent coke in the chamber, and being decomposed supplies the hydrogen for combining with the gases resulting from the decomposition of the oil trickling down from above.

In working the generator, the valves and oil pipes are first adjusted to make gas downwardly in one chamber and upwardly in the other chamber, and in the next making the gas made passes downwardly in one chamber and upwardly in the other. Thus, for making gas downwardly in one chamber and upwardly in the other, the gate valve is closed and opened, and oil is shut off at one pipe and turned on at the other. The oil from one pipe then trickles down over the hot baffle plates, passing down with a slow and tortuous course over the hot tiles which disrupt the oil into the constituent gases, which, as they move down, become thoroughly volatilized or gasified, and when they reach the bottom of the baffle plates they pass under the partition wall where they meet and mix with the hydrogen from the decomposed steam and with the hydrogen they rise through the tortuous path of the baffle plates, where they are fixed into a permanent gas by the red hot tile, and thence pass off through the gate valve. At the next gas making (the generator having been in the meantime heated up as before described) one gate valve is opened and the other closed, and the one oil pipe is closed and the other opened. The gas making then proceeds just the reverse of that shown by the arrows. The advantage of this reversal is that it keeps the tiles always clean and free from deposits of tar and lampblack and causes the heat and its effects upon the generator to be uniformly distributed.

The inventor makes no broad claims to the feature of baffle plates, or in carrying the hydrogen gas down through the checker work of one chamber, and up through the checker work in another, but he claims that with this generator the tile baffle plates are easily put in or taken out, and a great heating surface for fixing the gas is afforded without the use of checker work. He states that the generator is easily managed, and a very large output of good fixed gas is yielded without waste of oil or delays from cleaning out carbonaceous deposits.

The inventor of this process is not yet prepared to make any positive statements as to results attained. In the experimental plant mentioned 30,000 cubic feet were made in 25 minutes, and the reheating occupied 12 minutes. No nitrogen is used, and a fixed gas is claimed. The nearest approach to a prediction was the opinion that with this process illuminating gas could be made at a cost of 20 cents per 1,000 and fuel gas at 15 cents. A 6-inch pipe is to be run into the steel department of the W. Dewees Wood Company, at McKeesport, to test the gas in steel manufacture.

Cunningham's Circular-Roofed Structure Construction.

On August 23, 1892, U. S. Letters Patent (No. 481,347) were granted to Mr. Christopher Cunningham, Jr., of Brooklyn, N. Y., for a new and useful improvement in circular tanks and other circular roofed structures. Using the words of the specification—

The invention relates especially to oil tanks, gasholders and other circular-roofed structures of iron of large diameter, and its object is to obtain the necessary strength in the roofs of such structures with the least practicable weight of material.

To enable others skilled in the art to carry out the invention, I will proceed to describe it with reference to the accompanying drawings, in which Figure 1 represents a central vertical section of the roof and the upper parts of the side walls of the circular tank embodying my invention. Fig. 2 is a plan of the roof frame corresponding with Fig. 1. Fig. 3 represents a vertical sectional view, on a larger scale than Fig. 1, of one half of one member or section of the roof frame. Fig. 4 is a horozontal section, in the line $x\,x$ of Fig. 3, of a portion of the framing; and Fig. 5 is a plan view of what is herein termed the "tie beam plate."

Similar letters of reference designate corresponding parts in all the figures.

Fig. 1.

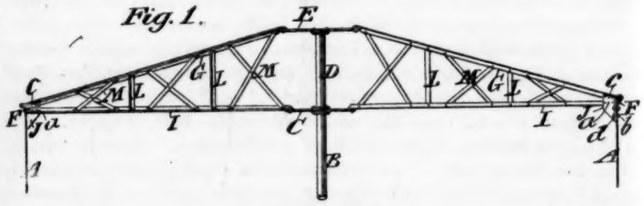
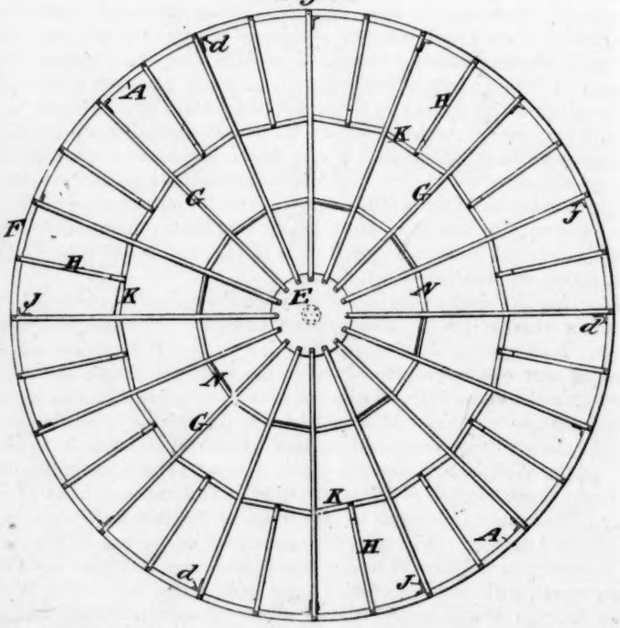


Fig. 2.



A designates the side wall of the tank, which is intended to be built up of iron plates, riveted together in the usual manner.

B is an upright post, which may be of iron tubing, erected in the center of the tank upon the bottom thereof or upon any suitable foundation

therein and extending from said bottom or foundation up very nearly to a level with the top of the side walls *A*. On this center post *B* is placed a concentric circular plate *C*, hereinafter termed the "tie beam plate," the upper end of said post being flanged for the support of said plate. Above this tie beam plate, directly over the center post *B*, is a post *D*, which may be termed the "king post," the said post being represented as flanged at its lower end to correspond with the flange of the center

Fig. 3

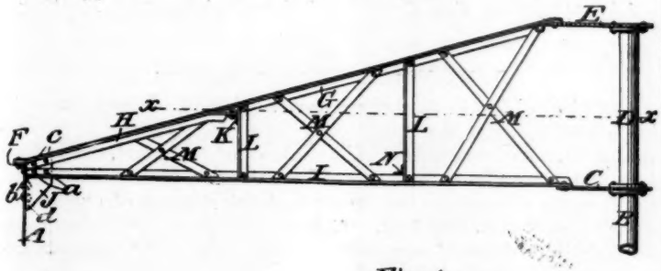


Fig. 4.

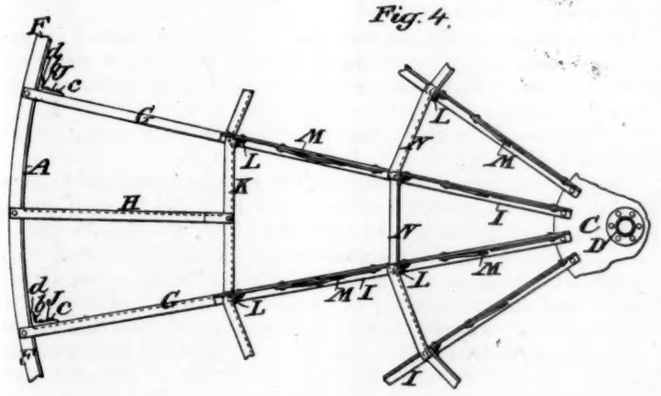


Fig. 5.

post *B*, and being flanged at its upper end for the support of a concentric circular plate *E*, hereinafter termed the "crown plate." The king post and the center post are riveted or bolted together through their corresponding flanges, and the tie beam plate is by the same means secured between them. The crown plate, which is represented slightly larger than the tie beam plate, is also riveted or bolted to the flanged upper end of the king-post *D*. The upper edge of the wall *A* is surrounded by an angle iron band *F*, which projects downward in the form of a flange, and which is hereinafter termed the "wall plate."

G G are rafters, which I have hereinafter termed the "main rafters," which are arranged radially between the crown plate *E* and the wall plate *F*, and having their inner ends supported upon and riveted to the crown plate, and their outer ends supported upon the wall plate. These rafters have an upward slope from the wall plates toward the crown plate corresponding with the intended pitch of the roof of the tank. Between the adjacent radial main rafters *G G* are placed and secured a series of purlins *K*, which serve to support the inner ends of short radial rafters *H*, the outer ends of which are supported upon the wall plate *F*. These short radial rafters are arranged intermediately with the main rafters *G*, and have a corresponding slope, and they are riveted to the purlins and to the wall plate.

I I are tie beams arranged horizontally and radially between the plate *C* and the side walls *A*, one of said tie beams being under each main rafter *G*. The inner ends of these tie beams are supported upon and riveted to the plate *C*, and their outer ends are riveted, as shown at *a a*, to what are termed "gusset plates" *J*, which are riveted, as shown at *b b*, to the side walls *A*, and also riveted, as shown at *c c*, to the rafters *G*. The said gusset plates unite the side walls, the main rafters and the tie beams. These gusset plates might be of heavy ordinary angle iron; but I have represented them as made of plate iron, one edge of which is turned at an angle to form a flange *d*, to be secured by the rivets *b* to the side wall *A*, such a plate providing for the longer and broader connection with the rafters *G* and tie beams *I* than ordinary angle iron would provide for.

Between each rafter *G* and the corresponding tie beam below it are arranged and secured uprights, which may be termed "queen posts" *L*. Between these queen posts, the crown plate *E* and tie beam plate *C*, between the said queen posts and the gusset plates *J*, and between the said queen posts themselves are arranged crossing diagonal braces *M M*, connecting the rafters with their corresponding tie beams. Between the adjacent tie beams *G* are arranged a series of horizontal braces *N*.

The rafters, the tie beams, the queen posts, the purlins, and the horizontal braces above described, may be of iron bars of any suitable transverse sectional form; but I have preferred to make them all of angle iron. The diagonal braces may also be of transverse sectional form; but I prefer to make them of flat bar iron. The riveted or bolted joints between the several parts may be made in any manner common to structures of such iron bars as are here used. Additional stability may be given to the structure by surrounding the center post *B* with a group of not less than three other supporting posts upon which the tie beam plate *C* may rest and receive additional support beyond that given by the center post. This is illustrated in Fig. 5, wherein three such additional posts *O O* are represented in dotted outline.

Judge Hallett's Decision in the Incandescent Lamp Litigation.

The following is the text of the decision pronounced by Judge Hallett, in the United States Circuit Court of St. Louis, in the matter of the application of the Edison Electric Light Company and others for an injunction forbidding the Columbia Incandescent Lamp Company from carrying on its business of putting on the market an incandescent electric lamp:

Complainants allege infringement of letters patent No. 223,898, issued to Thomas A. Edison, January 27, 1880, for an improved electric lamp. This patent came under the consideration of the Circuit Court of the Southern District of New York, in the case of the Edison Electric Light Company, vs. the United States Electric Lighting Company (47 F. R. 454), and was held to be for a lamp "consisting essentially of a filamentary carbon burner, hermetically sealed in a glass vacuum chamber." So understood, it is the incandescent lamp in common use, and no question is presented in this record as to the character of respondents' manufacture. The defense to the bill and to the motion for preliminary injunction now under consideration is want of novelty in the Edison patent. Respondents aver that an incandescent lamp, different in form, but in all essential features the same as that now in general use, was made as early as 1854 by Henry Goebel, of New York City, and that it was used by him in various ways and at different times for many years thereafter. It will not be necessary to describe this lamp at length, as it has the same constituents as the Edison lamp. We are at present more concerned with the struggle between the contending forces, on the one side to maintain and on the other to disprove, the existence and use of the lamp anterior to the date of the Edison invention. A large mass of testimony in the form of affidavits is offered by each party on the question of fact, which, to consider at length, would be a tiresome and unprofitable task.

The principal objection urged by complainant against the Goebel invention is that it has an impossible date; no man could make it in the time and manner assigned to it; the incandescent lamp is the product of several auxiliary arts not likely to fall within the compass of a single mind; as an achievement of science the lamp is a matter of progressive steps, some of which must be made by the world at large before others can be taken by anyone. This is no more than to say that no man can outrun his competitors to any great length in the field of scientific investigation—a proposition which has no support in reason or experience. There seems to be no reason for saying that Goebel could not reach in 1854 the point attained by Edison in 1879, unless, as was said by the dissenting Justices in the telephone cases: "It is regarded as incredible that so great a discovery should have been made by the plain mechanic, and not by an eminent scientist and inventor."

In so far, however, as it may be shown that the methods adopted by Goebel were not equal to the results obtained, the evidence should receive the most careful consideration. On this point it appears that Goebel has recently made several lamps of the form and with the material and tools formerly used by him. These lamps were tested by men of skill and experience in such matters, and they were found to be reasonably effective. They are not so good as the lamps in common use, but they can be operated, and they give reasonable service in time and capacity of light. So that in this way we have *prima facie* proof of

Goebel's ability to make lamps in the way he claims to have made them before the time of Edison's invention.

It is said that Goebel is involved in contradistinctions and misstatements of facts due to the lapsing memory of old age or to untruthfulness. Be it so; he does not appear to be an adventurer or an imposter. It is not reasonable to believe that he made the story related in his affidavit and did not make the lamp he has described. Whatever may be said as to Goebel's veracity, he is supported at many points by witnesses of good repute, who speak with precision and apparently with deliberation. As already suggested, it is not necessary or profitable to go over the testimony at length with a view to determine the relative value and weight of every part. It is enough to say that there is a fair preponderance of testimony in support of the Goebel claim.

There is not the measure of proof demanded by complainants' counsel, who maintain that the Court should require proof of the fact beyond reasonable doubt. This degree of certainty is not often attained upon testimony in the form of affidavits where the issue is contested. And it is not reasonable to demand such certainty as to the defense. Complainants must show a clear right in support of a preliminary writ, and a defense which puts the case in doubt is sufficient to defeat the application. (Goodyear vs. Dunbar, 1 Fisher, 472; Glaenzer et al. vs. Wiederer et al., 33 Fed. Rep., 583; Fraim vs. Sharon Valley Malleable and Gray Iron Company, 27 Fed. Rep., 457; Cary vs. Domestic Spring Bed Company, 26 Fed. Rep., 38; Robinson on Patents, Sec. 1,171.)

It is also contended that the decree of the Circuit Court of New York against the United States Electric Lighting Company, sustaining the patent, which decree has been affirmed by the Court of Appeals of the Second Circuit, is conclusive of complainants' right to the writ for which they now ask. No doubt is entertained as to the conclusive effect of that decree here and elsewhere, as to all matters in issue in that cause; for although respondent was not a party to that litigation, the Court would not, on a preliminary motion, consider any matter which passed to judgment in that suit. But the Goebel defense was not made in that suit, and therefore the case has not the authority on this motion which has been ascribed to it. (National Hat Pouncing Machine Company vs. Hedden et al., 29 Fed. Rep., 147; Lockwood vs. Faber, 27 Fed. Rep., 63; The Bailey Wringing Machine Co. vs. F. F. Adams et al., 3d B. & A., 96.)

Another suit by the complainants against the Beacon Vacuum Pump and Electrical Company in the Circuit Court of the District of Massachusetts is in a different attitude. In that suit the Goebel defense was made, and upon motion for preliminary injunction recently heard and allowed, it was overruled. It is contended that the ruling in that case should be recognized and followed as a precedent in respect to the present motion. And perhaps if the issue, the testimony and the situation of the parties appeared to be the same in both cases, such result might follow more from the persuasive effect of the opinion of another court on the same matter than from any notion of authority ascribed to such opinion.

In courts of equal jurisdiction proceeding concurrently in the investigation of the same subject the right and duty of each to exercise independent judgment cannot be denied. That they should in the end reach the same result is greatly to be desired, but one cannot become an echo to the other for that praiseworthy purpose. In this instance the consequences to flow from diverse opinions are not regarded as serious. In the Massachusetts circuit, and here as well, the motion is interlocutory, and in each case the ruling may well enough stand upon the situation of the parties. And we have much additional testimony to that upon which the Court acted in the Beacon case; so that upon all points I do not feel compelled to accept the opinion of the Court in that case.

The ruling of the Court, however, in the Beacon case suggests the propriety of taking security from the respondent for observing the decree in case complainants shall ultimately prevail in this suit. There are other considerations also which should have weight in that direction. It was suggested by complainants' counsel that respondent is a concern of small capital, and that it was made so with intent to avoid responsibility in respect to the infringement now alleged against it. This was not denied, and I suppose we may take it to be true. The retort was in the form of a charge against complainant that it used its monopoly of electric lamps to control the sale of all kinds of electrical machinery and apparatus. This charge also passed without denial, and it is not difficult to conceive of circumstances in which it would be necessary to ascertain whether it is true. Referring only to the charge against respondent of sufficient capital and assets, the duty of the Court is plain to provide for the contingency of a decision against it. It need not refer to the possible effect of cross-examination in the case of a multitude of witnesses. What now seems plain enough may altogether disappear, and new facts may come to the surface under that crucial test.

The injunction will therefore be refused if the respondents shall give a bond in the sum of $20,000, conditioned for the payment of such sum (if any) as may be decreed in favor of complainants on the final hearing of this case, the bond to be filed with the clerk of the Court, and to be approved by the clerk or by a judge of the Court, within 20 days from this day.

Advantages of Gas Over Coal for Cooking and Heating Purposes.

By Mr. William Wallace Goodwin.

The principal fuel in all civilized countries is coal. It contains within its exterior a store of energy almost incredible. We may form some idea of this vast force ready to obey the laws of its nature, demanding only that the conditions be favorable for the conversion of its constituent elements, through the agency of the chemical union of oxygen, in order to convert it into heat. A force capable of performing work through the medium of our stoves or ranges, as their conditions are more or less favorable for economic conversion.

The greater part of the coal furnished in the United States is bituminous. It contains less carbon than anthracite, but there is not much difference in its heating power, pound for pound, if pure and free from foreign matter, the volatile portions being rich in hydrocarbons, giving off great heat, if the combustion is perfect, known as energy, or the power of doing work.

The energy of coal, or its power to do work, may be assumed to have a value of 14,500 heat units per pound; this multiplied by the thermal unit 772, known as Joules' mechanical equivalent, will give the energy necessary to raise 11,914,000 pounds one foot high in one minute. This represents the potential energy of one pound of coal, or the utmost limit of work in that quantity, but which can never be arrived at in practice. This being true, there being so great a loss attending the generation of heat from solid fuel, there is quite as much heat lost in its application; in fact the loss is greater in proportion, as the amount of coal burnt becomes less in quantity.

Another cause of loss in the burning of coal in our stoves and ranges is of sufficient importance to deserve mention, and that is the fact that there is mixed with the coal a considerable portion of foreign matter, not combustible, which absorbs heat and gives no equivalent, represented by the ash and clinker, which every household consumer of coal knows to be a large item—amounting from 10 to 15 per cent. of material paid for. Let us illustrate. Every housekeeper must have been struck with the fact that a large amount of wood and coal is burned before the range is ready to cook, and that a large amount is still used after the cooking is done; yet it is found cheaper to keep the fire up between meals, even when it is undesirable, than to let it go down and rekindle three times. For instance, the excessive quantity employed in the trifling operation of boiling a kettle—the whole fire space is necessarily kindled, although not more than one-tenth of it is required.

Twenty pounds weight of good anthracite coal contains energy sufficient to raise 270,000 pounds of water one degree in temperature, or 1,776 pounds from 60° to the boiling point, 212°; and yet this power is frequently employed in making a pot of coffee. If we have employed in this operation heat enough, if properly applied, to raise three quarters of a ton of the same liquid from atmospheric temperature to boiling point, may it not be claimed that it is a somewhat luxurious beverage The items of labor and inconvenience incident to the use of coal are, therefore, too apparent to need any further enlargement.

These are some of the principal arguments against the general use of this form of fuel, and they justify the assertion that not over 10 per cent. of such heating power is utilized, for it should be remembered that it is only the gas that we burn, generated from the coal, from which we derive the heat; so that the question comes up, "Can a family make a limited quantity of gas in their defective ranges and stoves as economically as the same, or a much better article, can be made on a large scale by a gas company?" We claim not. It might as readily be claimed that we can grind our own flour or weave our own fabrics as cheaply, as to successfully compete with a large gas works properly constructed and economically managed.

We claim that among the advantages connected with the use of gas as a fuel are—

1st. The cost, labor and inconvenience of handling solid fuel is avoided, as the gas is capable of easy distribution.

2d. It is a form free from impurities which involves a large waste, as already referred to, besides impairing combustion.

3d. If a purely combustible gas, it is free from those ingredients which involve a larger loss than the cause just mentioned.

4th. It is precisely the condition to unite perfectly and instantly with the oxygen of the air, thereby securing a thorough combustion.

5th. It gives an immediate and uniform result, as the flame temperature is constant.

6th. The intense and steady heat of the flame saves time and money by the presentation of an even fire surface ready at the moment of ignition.

7th. It is a fire capable of concentration upon the precise point where the result is desired, as well as being under control, as the simple turning of the valve controls or stops the combustion at will.

8th. The cleanliness of the system, there being no dirt or residuals left.

9th. The great advantage from a sanitary standpoint of simply burning combustible gases instead of attempting to make them by means of the imperfect gas machines called stoves. In the one case the only risk is the possibility of a leak which is readily determined by the sense of smell, and which can be eliminated at once. In the other is a more serious risk, because the defect is a chemical one, consequent upon imperfect combustion; and the introduction of poison into the atmosphere, so frequent and insidious, to say nothing of the deoxidation of the air by contact with red-hot iron surfaces. The reduction of this particular danger is in proportion to the completeness of the combustion of the more refined fuel.

We claim these facts to be overwhelming arguments in favor of the use of gas for fuel purposes as against the gross form of fuel known as coal; and this leads to the inquiry of the availability of gas for that purpose. Gas, as furnished by our gas companies for illuminating purposes, possesses the requisite qualities, being of great purity, sufficiently low in density to render its distribution easy with a high flame temperature; but while the constituents which impart the illuminating power are expensive and not necessary for fuel purposes, yet practical experience in its use proves that in many departments at least it is certainly cheaper than coal, besides its many other advantages.

A few years ago, in order to demonstrate and prove these facts and advantages of cooking by gas over those of coal, we entered into a set of elaborate experiments, and for that purpose used a No. 7 "Sun Dial" gas stove in competition with a coal range known as the "Peerless," and took occasion to publish the results.

The question has frequently been asked us why there was such a difference in loss in favor of the gas stove; the fish, beef, chicken, steak, and chops were baked, roasted and broiled in the broiling chamber of the gas stove by the heat radiated from the gas therein consumed; whereas the baking and roasting were done in the oven of the coal range, and the broiling over the fire. The fact has been well established that articles cooked in the latter manner lose a large percentage in weight, for the reason that the effect of the heat is to drive off the juices of the meat in the shape of vapor, which, of course, is lost, while the heat from the gas stove, being by radiation, the first effect of the same in the broiling chamber is to at once coagulate the albumen of the meat, thereby forming a coating around the surface, which helps to retain a much larger percentage of juices of the meat in the broiling of the same.

This is readily proven by weighing a steak and then broiling it over a coal or charcoal fire and witness the dropping of the juices into the same, or the passing off of the juices in the form of smoke and vapor. When the steak is cooked compare it with one that has been weighed and broiled in the broiling chamber of a gas stove, and observe the swelling up of the meat induced by the retention of the juices, which are first vaporized by the heat and retained by the coagulation of the albumen. Weigh the two steaks thus cooked in this manner and our assertion will be proven; also, observe the difference in the cutting or carving with a knife, and see how the juices of the meat cooked by the gas range flow on to the plate and around the meat, while the steak cooked over the fire will be more or less dry and deficient in its juices. These facts have been well established, both in the small way, as by our table, and in large hospitals in Europe, where gas is used for cooking purposes. These facts, coupled with the advantages already enumerated, show the superiority of a gas stove over the old-fashioned mode of cooking by coal.

At the annual meeting of the Wilmington (N. C.) Gas Light Company the following officers were chosen: Directors, E. S. Martin, Dr. A. J. De Rosset, Capt. J. F. Divine, George W. Kidder, G. H. Smith, George R. French and Hugh McRae; President, E. S. Martin, Secretary and Treasurer, Richard J. Jones; Superintendent, John W. Reilly.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

The Somerville (Mass.) Gas Company has been dissolved by a decree of the Legislature.

It is reported that Councilman Buss aud others of the local authorities of the Medford district have inaugurated a crusade against the Malden and Melrose (Mass.) Gas Company, the purpose of which is to compel the Company to make a considerable concession in the gas rates. The average rate received by the Malden Company for gas during the year 1891–2 was $1.77 per 1,000, which looks to the unprejudiced observer, all the phases of the gas supply in that section considered, as a very fair one. In the preceding year the average rate amounted to $1.91.

The Pawtucket (R. I.) Gas Company is ready to make a very extensive series of improvements this season, as will be readily understood from a perusal of the following statement: A new station meter, of 1,250,000 cubic feet capacity per diem, to be constructed by the American Meter Company; a new set of purifiers, 12 feet by 24 feet, to be set up by the Davis & Farnum Manufacturing Company, the trays to be furnished by Mr. John Cabot; an extension of the Standard washer scrubber, in charge of the Isbell-Porter Company; and in all likelihood, another 6 foot set of the United Gas Improvement Company's improved Lowe generating apparatus. In the electric division of the Company's plant will be installed another 600-horse power cross-condensing engine of the Harris-Corliss type, with 90 feet of shafting and friction clutch pulleys; also generators for electric street car service, and dynamos for 300 additional arc lights.

The Fulton-Municipal Gas Company, of Brooklyn, N.Y., is now installed in its handsome new offices, at 44 Court street. As usual, the Company will maintain a well-arranged and complete display of gas cooking and heating appliances.

Towards the close of last month articles incorporating the Suffolk Gas Company, of Islip, Long Island, to supply gas and electric lights in the district on the east of what is known as the Great South Bay, were filed. The incorporators are B. I. H. Trask, I. L. Egbert and Franklin Everhart, of New York, Charles A. Kittle, of Mount Kisco, N. Y., and A. D. Palmer, of East Orange, N. J.—a combination that resembles very much the one that is in control of the East River Gas Company. The capitalization is put at $200,000. Islip is a beautiful post village on Great South Bay, about opposite to the Fire Island lighthouse, and is a noted summer resort. Besides the summer population, it shelters all the year round many wealthy families, noted in the social circles of New York and Brooklyn. Adjoining it, in a similarly named township, are the villages of Bay Shore and Sayville. It may be possible that the Suffolk Gas Company is to take over the plant of the Huntington Gas Light Company, originally planned by Mr. George Olney and his associates, the intention of whose proprietors at the start was to supply gas not only in Huntington but also in Bay Shore and other points.

The proprietors of the Darby (Pa.) Gas Company have about made up their minds to cut the gas rate to $1.50 per 1,000 cubic feet, a concession of 30 cents per 1,000.

It is said that work on the buildings for the proposed plant of the Consumers Gas Company, at Wilkes-Barre, Pa., has been commenced. The site selected is on Dana street, close to and between the tracks of the L. & S. and L. V. Railroad tracks.

We are indebted to a "Travelling Man" for the following, from Urbana, Ohio. "At the annual meeting of the Urbana Gas Light and Coke Company, all of the members of the Board of Directors, and a majority of the shareholders, were present. The shareholders were so satisfied with the reliability of their executive management that the old Board of Directors was re-named for the ensuing year. Mr. D. C. Spinning was subsequently re-elected President, and Mr. Joseph Light was re-elected Vice-President. Of course, Mr. A. B. McGuire, the popular and efficient Superintendent, was named to succeed himself. The local paper, in commenting on 'Mac's' reappointment, remarks: 'During his two years of incumbency, Mr. McGuire, by his excellent executive ability and strict attention to business, as well as his genial personality, has become deservedly popular with the Company as well as the consumers.' The Company had a very prosperous year, and the proprietors, after much discussion, in which the advisability of installing a water gas plant was a prominent feature, although no definite conclusion in respect thereto was reached, decided to authorize important additions to

the main service, and to add a bench of retorts to the carbonizing plant."

Some days ago Mr. Herbert M. Hill, City Chemist to the Corporation of Buffalo, N. Y., at the order of the Commissioners of Public Works, made a test of 23 arc lights, the examples having been selected at 23 distinct points, to determine the actual candle power yielded by the same. The tests were made, to use the language of the Inspector, "on evenings when the lamps might be expected to be in fair working order." It might be further said that the lamps, under the contract with the city, are each rated to yield 2,000-candle power. Here is the result: Lamp No. 1, 1,185 candles; lamp No. 2, 384 candles; lamp No. 3, 1,272 candles; lamp No. 4, 642 candles; lamp No. 5, 777 candles; lamp No. 6, 399 candles; lamp No. 7, 363 candles; lamp No. 8, 2,295 candles; lamp No. 9, 765 candles; lamp No. 10, 814 candles; lamp No. 11, 1,241 candles; lamp No. 12, 649 candles; lamp No. 13, 647 candles; lamp No. 14, 775 candles; lamp No. 15, 838 candles; lamp No. 16, 415 candles; lamp No. 17, 448 candles; lamp No. 18, 1,442 candles; lamp No. 19, 636 candles; lamp No. 20, 627 candles; lamp No. 21, 319 candles; lamp No. 22, 872 candles; lamp No. 23, 270 candles. This gives an average candle power of 807.50, which is rather better than such averages usually are. If, however, the lamp (No. 8) that is reported as having given 2,295 candle power is left out of the calculation the candle power of the 22 remaining lamps will be but 740—which approximates much closer to the stories of this kind that we usually hear.

The offices of the Burlington (Vt) Gas Company have been removed to a store on the ground floor of the Young Men's Christian Association headquarters.

The Connecticut Legislature has granted the petition of certain capitalists, who asked permission to incorporate the Darien Gas Company.

The new plant for the Keene (N. H.) Gas Company has been started up. No hitch occurred in the breaking in, and Supt. Rossman is breathing easier.

The American Gas Company, of Philadelphia, Pa., which controls the gas supply of New Rochelle, N. Y., has just awarded a contract for the erection of a double-lift holder at that point of a rated working capacity of 250,000 cubic feet. This seems to mean that, on the completion of the holder, the New Rochelle generating plant will be shut down, the gas supply thereafter to be taken from the works at Mount Vernon (about 3½ miles distant), which are also dominated by the American Company. General Manager Ramsdell's fine ex-Indiana hand certainly shows through this, and he is to be congratulated on the cleverness of the move. It ought to, and will, save the American Company a good round sum of money.

The Committee on Manufactures of the Massachusetts Legislature has given leave to withdraw in the matter of the bill presented by the Hon. Moody Merrill, which permitted the consolidation of the Boston Gas Companies.

Mr. Allen N. Sill, formerly of Corning, N. Y., has accepted a responsible position in the service of the Hot Springs (Ark.) Gas and Electric Light Company.

A rather significant transaction is reported from Concord, N. H., under the terms of which the Concord Land and Water Power Company will hereafter operate the electrical plant hitherto owned and operated by the Concord Gas Light Company. The price paid is said to have been in the neighborhood of $110,000.

The following, from the Boston *Record*, explains itself: "The decision of the Board of Gas and Electric Light Commissioners (promulgated on April 25th), to the effect that the Brookline Gas Company has been acting illegally in laying its pipes in the city of Boston, and in asking the Attorney General to take action in the matter, was made voluntarily on the part of the Board. It was not the result of any petition, though the representatives of the Gas Company were called into a conference, held March 31. There were present Messrs. C. P. Greenough, for the Boston Gas Light Company, Dr. Robert Amory, R. M. Morse and A. C. Burrage, for the Brookline Gas Company, and Mayor Matthews and Corporation Counsel T. M. Babson, for the city of Boston. At the meeting on April 25th, after discussing the matter, Commissioner Barker offered the following: 'That notice be sent to the Attorney General and to the Brookline Gas Company, that said Company appears to have violated Section 4, Chapter 104, of the Acts of 1884, and the provisions of Section 75, Chapter 106, of the Public Statutes, in that it is proceeding to dig up and open the grounds of the streets, lanes and highways of the city of Boston for the purpose of laying gas pipes therein, without the consent in writing of the Board of Aldermen of said city.' Mr. McDonald, Chairman of the Board, thought that the Board should not adjudicate the question of violation of law, but leave the whole matter for the Attorney General to act upon; and so moved, as a substitute for Mr. Barker's motion, 'That before the Board takes final action upon the matter embraced in Commissioner Barker's motion, the Board consult and advise with the Attorney-General in relation to the questions of law involved in the determination of the legality or illegality of the doings of the Brookline Gas Company, alleged to be in violation of law.' This motion was lost and Commissioner Barker's motion was adopted, Chairman McDonald dissenting, and notices have accordingly been sent to the Attorney-General and the Brookline Gas Company, thus leaving it with the Attorney-General whether steps shall be taken in the courts. Mr. R. M. Morse, counsel for the Brookline Gas Company, subsequently gave it as his opinion that the decision of the Commissioners was not of great importance, as no action would be taken in the case, unless the Attorney General should decide that the Company had acted illegally. He regarded it as a mere shifting of the responsibility of deciding the matter from the Commissioners to the Attorney-General.

The capital stock of the Toledo (O.) Electric Light Company has been increased to $500,000, from $200,000.

Batavia, N. Y., is said to be in darkness. Owing to the failure of the city to arrange a contract for the public electric lighting, the current was shut off from the street lamps.

We regretfully chronicle the death of Mr. Matthew Cartwright, whose demise occurred at the Hahnemann Hospital, Rochester, N. Y., on the afternoon of April 25th. We are indebted to a correspondent at Rochester for the following particulars respecting Mr. Cartwright's career, whose honorable connection with the gas business for upward of 25 years had made him well known to and deservedly esteemed by the gas fraternity of America—the deceased was one of the well-known Cartwright family of Philadelphia, who have been prominent in the gas business for many years. Our correspondent writes: "Matthew Cartwright was born in Philadelphia, January 10, 1845, and came to Rochester in 1873. His brother, Robert Cartwright, had built the plant of the Citizens Gas Light Company, of Rochester, and he came to the city to act as the Company's Superintendent. Throughout the greater part of his life he was engaged in the business here and elsewhere. Before coming to this city Mr. Cartwright lived for a time in Meadville, Pa., and in 1876 he left Rochester for Buffalo, N. Y., to become Superintendent of the Buffalo Gas Light Company. Subsequently he was identified with the gas business of Rochester, and although given great responsibilities, his management was remarkably free from accident or loss affecting his Companies or his employers. He was a member of the American Gas Light Association, having been elected to membership therein at the second Annual Meeting, held in Brooklyn in 1874. For some years he was prominent in its affairs, and did good work in committee and on the floor. He was also a member of the Rochester Club. Perhaps Mr. Cartwright was best known in the social circles of Rochester as a member of the Rochester Yacht Club. He was one of the incorporators of the Club (1887), and was a member of its Board of Trustees. He was Vice Commodore in 1887-89-90, and Commodore in 1892. In 1891 he was Vice President of the Lake Yacht Racing Association, and in 1892 President of the Association. He was a member of the Association's Executive Committee in 1890-91-92. He was one of the party who brought the celebrated Madge to the Lake, and he held an interest in the boat for several years. Although he was not a yacht owner, during the last year or two he always took an active interest in the Club, and yachting on the Lake in general. He was at one time quite active in Masonic circles. Last March he visited Washington to participate in the inaugural ceremonies, but, feeling ill, he returned to Rochester before the ceremonies were held. The attack of illness developed into pneumonia, and about mid-March he was removed to the Hahnemann hospital. Having almost recovered from this an unexpected complication, in the shape of uræmic dilution of the blood, set in, from the effects of which he succumbed on the date above noted. He leaves two brothers, Robert Cartwright, of Rochester, and William Cartwright of Philadelphia, and five sisters. The remains were removed to Philadelphia, in which city the funeral services were held, on Friday, April 28."

The fullest measure of sympathy will be extended by the fraternity to Mr. Henry Maurer, of this city, whose estimable wife, Susan M. Link,

passed away on Sunday, April 30th. The funeral services were celebrated on the evening of May 2d, in the Maurer residence, No. 143 West 79th street.

THE following notice now being printed in the local papers, at the instance of the Delaware County (Chester, Pa.) Gas Company, goes to show that the proprietors are disposed to be up and doing: "The Delaware County Gas Company, on and after July 1st, 1893, will reduce the price of illuminating gas to $1.60 per 1,000 cubic feet, subject to the following schedule of discounts, for prompt payment, within 10 days after presentation of bill:

"Consumers up to 10,000 cubic feet, a discount of 10 cents per 1,000.

"Consumers from 10,000 to 50,000 cubic feet, a discount of 20 cents per 1,000.

"Consumers from 50,000 to 200,000 cubic feet, a discount of 30 cents per 1,000.

"Fuel gas, $1.10 per 1,000 cubic feet, a discount of 10 cents per 1,000.

"Where parties burn less than $1 worth of gas in any one quarter, sufficient meter rental will be added to make the amount of the bill $1. The reduction will give the citizens of Chester and South Chester the opportunity to secure a first-class illuminant at a very moderate cost. The gas is perfectly pure and of full 22 candle power." The policy of the Company is to run services from the main to the curb line, without charge to the consumer.

IT seems that the travelling meter inspector has been superseded by a "company" nowadays, but the methods of the "company" are about identical with those of the nomadic tribe that they replaced. Chicago appears to be the last place affected by those precious specimens of frauds, in which city the "company" is known as the United Inspection Company. Its promoters present to the unwary consumer a very "taking" lot of trash, the burden of which is that every gas meter runs fast, and so on. The officials of the Chicago Gas Light and Coke Company, however, soon "got after" the "company," through causing to be published in the local dailies the following advertisement: "A Company styling itself the United Inspection Company has been making a so-called test of our gas meters. We hereby state that they are not authorized by us to make any tests of our meters, and we do not recognize their certificates in any way, shape or manner. We further state that we have not and will not make any rebate on gas bills on any of their certificates which have been or may be presented to us. Any consumer who has reason to believe that his meter is not in perfect order may apply to us for a test of the same; if this test is not satisfactory the consumer may apply to the City Gas Inspector, whose certificates of tests are the only ones that are recognized by this Company. The methods employed by the United Inspection Company are such as will not insure a correct test of a meter. They sometimes style themselves the United States Inspection Company, which might give the impression to the consumer that they are representatives of the United States Government." Mr. C. K. Wooster, the conservative and well-balanced Secretary of the Chicago Gas Light and Coke Company, in referring to the advertisement and to the ill-favored doings of the Inspection Company, said: "We published the advertisement as a matter of protection to our patrons. This Inspection Company began in February a system that has given us needless trouble. They enter a consumer's house and propose to test his meter for charges ranging from $3.50 to $7.50 for each meter. They detached our meters to make their test at first. I visited them and notified them they must stop meddling with our house connections; therefore they attach a rubber tube to the inlet pipe and pass the gas through their meter, burning off 10 feet. Then they compare the two meters and announce the result as indicative of the state of our meter. They then issue a certificate, and therein lies the point of the operation. The certificates give consumers the impression that they will be received by our Company. Within a short time 40 people have come here with certificates and demanded rebate for alleged faulty meters. We have told everybody that we do not recognize any such certificates, but it has been difficult to convince some consumers. One man came here with a certificate and wanted to know if we presumed not to recognize the United States Government Gas Inspector. The method of testing which they employ is incorrect, but the main point is that we don't recognize such certificates as they issue, and to let the public know that was the purpose of the advertisement. If a consumer thinks his meter is untrue he should notify us and we will cause an immediate test to be made. The only outside inspection that we recognize is that made by the City Gas Inspector. It is the privilege of every consumer to appeal to him. The city fee is $2.50, unless the meter be found to be 2½ per cent. at fault, in which case the money is refunded to the complaining consumer. The United Inspection Company's smallest fee is $3.50."

THE Rockford (Ills.) Gas Company, which is controlled by the American Gas Company, of Philadelphia, is again in the field for extending the use of gas for purposes other than lighting. Notwithstanding the large number of stoves and ranges that have already been placed in the pretty city on the Rock river, Manager Whipple has evidently made up his mind that there is room for more. To solidify this void he is appealing to the public mind through the columns of the *Register Gazette*, in which newspaper he occasionally orders a *full page*—the page is 20 inches by 26 inches—displaying thereon a profusion of cuts illustrative of some of the designs of stoves carried in stock by the Company. Of course, the cuts are described in terse and telling sentences; nor did the compiler omit to make clever mention of the advantages of gaseous over solid fuel.

MR. C. J. R. HUMPHREYS, of the Lawrence (Mass.) Company, whose ability as a writer has been time and again demonstrated in our columns, is also out with another of his well-arranged compilations, designed to put before the residents of his city many little hints tending to show how gas may be intelligently used—not abused. The title of his compilation is "Wrinkles," and there can be no doubt about it that a careful application of the truths that it holds will smooth out many a corrugation on the brow of the disgruntled consumer, who, we will say, derived his particular brow furrows from an attempt to read his evening newspaper underneath a gas bracket equipped with a burner, the history of which could be traced for—may we say 20 years?

AT the meetings of the Columbus (Ohio) Gas Company, held for the purpose of electing officers for the ensuing year, the following result was reached: President, Emerson McMillin; Vice President, Irvin Butterworth; Secretary and Treasurer, A. P. Lathrop; Assistant Secretary and Treasurer, C. L. Horlon; General Manager, Irvin Butterworth; Directors, Emerson McMillin, N. B. Abbott, Irvin Butterworth, P. H. Bruck, Alfred Thomas, D. E. Putnam, C. D. Firestone, Frank C. Hubbard and James Watson.

THE Philadelphia *Item* is agitating an appeal to Mayor Stuart for dollar gas in that city, and is publishing a coupon in each issue (indorsed, "Mayor Stuart, we are in favor of dollar gas," with a couple of blank lines for the name and address of the sender), which it urges its readers to cut out and forward to the Chief Executive.

ACCORDING to the St. Louis *Globe-Democrat*, Mr. Vincent L. Elbert, of Los Angeles, Cal., has filed suit in the United States Circuit Court of Appeals, St. Louis district, against the St. Paul (Minn.) Gas Light Company. Complainant alleges that the defendant is using, without compensation to plaintiff, a valuable device of his applicable to the manufacture of water gas, and prays for a perpetual injunction restraining such use. It is asserted that a similar petition, tried by the District Court of Minnesota, was decided against Mr. Elbert.

Magnesia Firebricks.

Some weeks ago, at a meeting of the French Society of Civil Engineers, a discussion took place on the possibility of obtaining higher temperatures in steel furnaces. At present the temperature is limited by that at which the walls of the furnace begin to fuse, and even Diners firebricks are not proof against this. Magnesia is claimed to be capable of standing far higher temperatures than the Diners brick. It is used, according to a statement made at the meeting referred to, by M. Lencauchez, and was first proposed by M. E. Muller in 1869. The principal difficulty in using it is the excessive shrinkage to which it is liable when heated. Thus, a cube of magnesia of 10-in. edge, in the raw state, is said to shrink to one of 6-in. edge when sufficiently calcined. For this reason furnace linings made of this material were liable to crack badly. The remedy for this state of things is to cause the magnesia to undergo its maximum possible contraction before being placed in the furnace, but for this an excessively high temperature is required.

These difficulties have, it is claimed, now been overcome, and M. Lencauchez showed the Paris Society of Civil Engineers a number of perfectly solid bricks of magnesia, which were as dense as granite, and had been thoroughly shrunk. On analysis the bricks are found to have the following composition:

Silica	1.50 to	2.50
Alumina and iron oxide	0.75 "	1.25
Lime	1.50 "	3.00
Magnesia	96.25 "	93.25
	100.00	100.00

The high temperature required to insure that the bricks shall not be liable to further contraction is obtained by suitably designed gas kilns.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

MONDAY, MAY 8, 1893.

The Market for Gas Securities.

The general share market is in such a perturbed state that reported prices are about as indicative of the intrinsic merits of the securities dealt in as a falsehood would be representative of the truth. Wall street has simply gone crazy, and the financial ghouls who fatten on the miseries of those whom they enmesh are in high glee. There is really but little confidence in anything or anybody, and the market is entirely at the mercy of the scalpers and the ghouls. Consolidated opened to-day (Friday) at 112½ to 113, and those with money, that occasionally take a flyer at gas stocks, and do not have a try at Consolidated, ought to be without money. There is no earthly reason for the decline in it; on the contrary, there is every reason why it should advance. Equitable is a trifle easier, at 192 to 195, and Mutual is a shade duller, at 140 to 145. Over in Brooklyn the situation remains unchanged, save for a slump in Metropolitan and old Brooklyn; but we imagine very few shares could be obtained at the figures returned. The deal for consolidation is going ahead quietly, and is much nearer a finality than is generally supposed. Chicago gas opened to day at 65, and at 12:30 it was reported at 69½ to 70. It is very cheap at those figures. Laclede common is offered at 20, and 65 is offered for the preferred. Baltimore Consolidated is quoted at 60 to 60½. Bay State securities are dull and neglected. We note a sale at auction of 50 shares Indianapolis (Ind.) Gas Company, at 140.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 WALL ST., NEW YORK CITY.

MAY 8.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	112½	113
Central	500,000	50	90	95
" Scrip	220,000	—	—	100
Equitable	4,000,000	100	192	195
" Bonds	1,000,000	—	106	108
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	115
Mutual	3,500,000	100	140	145
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Standard Gas Co—				
Common Stock	5,000,000	100	85	90
Preferred	5,000,000	100	38	40
Yonkers		50	112	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	—	126
Citizens	1,200,000	20	107	108
" S. F. Bonds	320,000	1000	—	103
Equity Gas Light Co	2,000,000	100	45	—
Bonds	1,000,000	—	—	75
Fulton Municipal	3,000,000	100	—	135
" Bonds	300,000		102	—
Peoples	1,000,000	10	—	96
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	870,000	100	101	—
" Bonds (5's)	70,000	—	100	—
Nassau	1,000,000	25	170	—
" Ctfs	700,000	1000	99	100
Williamsburgh	1,000,000	50	150	—
" Bonds	1,000,000	—	107	110
Out of Town Gas Companies.				
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	82½	84
2d " " "	3,000,000	1000	64½	—
Bay State Gas Co.—				
Stock	5,000,000	50	26	27
Income Bonds	2,000,000	1000	—	65
Buffalo Mutual, N. Y.	750,000	100	110	—
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
Chicago Gas Company.	25,000,000	100	69½	70
Chicago Gas Light. & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	85	90½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	101
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	108
2d "	2,500,000	1000	104	105
Consumers Gas Light Co., Jersey City	2,000,000	100	25	—
Bonds	600,000	1000	85	90
Cincinnati G. & C. Co.	7,000,000	100	192	—
Consumers Toronto	1,600,000	50	190	191
Central, S. F., Cal			90	100
Capital, Sacramento, Cal			50	57
Consolidated, Balt.	11,000,000	100	60	60½
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	85	101
Bonds	250,000		—	—
Detroit Gas Co.—				
1st Mortgage			85	87
East River Gas Co., Long Island City	1,000,000	100	100	105
Bonds	500,000	100	100	102
Hartford, Conn	750,000	25	120	128
Jersey City	750,000	20	180	200
Laclede Gas Light Co., St. Louis, Mo.—				
Common Stock	7,500,000	100	17	20
Preferred "	2,500,000	100	60	65
Bonds	9,034,400	1000	80¾	81
Louisville, Ky	2,570,000	50	125	130
Little Falls, N. Y.	50,000	100	—	100
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	200	208
Memphis (Tenn.) Gas	750,000	100	40	—
" Bonds.	240,000	100	103	—
New Haven, Conn		25	200	—
Oakland, Cal			42	55
Peoples, Jersey City		—	115	125
" " Bonds			—	—
Paterson, N. J		25	99	102
Rochester, N. Y		50	99	100
Syracuse, N. Y	500,000	25	—	—
San Francisco Gas Co. San Francisco, Cal.	10,000,000	100	72½	73
Washington, D. C	2,000,000	20	240	240
Wilmington, Del.		50	59	88

FOR SALE,

One Hundred (100) Barrels Strictly Pure Coal Tar.

Address LAMBERTVILLE GAS LT. CO.,
935-2 Lambertville, N. J.

WANTED,

By a Gas Meter Maker,

A Situation in a Gas Works.

Best of references given. Address "METER MAKER,"
935-2 Care this Journal.

Young man at present in charge of a Coal Gas Plant, the output of which was 75 millions last year, desires a

Position as Superintendent of a Gas Company

in a Western or Southwestern city, where the chances for future development are good. Has had experience with water gas. Best of recommendations from officials of company in which he is at present employed. Address
934-3 "X.," care this Journal.

Position Wanted

As Superintendent of Gas Works

by a man fully competent in every respect, and who has had 20 years' experience. Or **would Lease a Small Works.**
930-tf Address "J.," care this Journal.

Position Wanted

AS SUPERINTENDENT, ENGINEER, OR ASST. ENGINEER OF GAS WORKS,

by a good, reliable man, who is a first-class draughtsman, familiar with the construction of all kinds of Coal and Water Gas Apparatus. Best of references. Address "A. B. C."
933-4 Care this Office.

WANTED,

Three or Four Purifying Boxes,

Not less than 8 feet square.

Address CAPITAL GAS AND ELECTRIC LT. CO.,
935-6 Frankfort, Ky.

WANTED,

Two Second-Hand Purifying Boxes, 4 x 4 ft.

Address ALEXANDER SMITH, Supt.,
934-3 Frostburg Gas Lt. Co., Frostburg, Md.

For Sale.

One Exhauster, 10-in. Connections and Bye-Pass Valves; also Pressure Governor attached.
Two Small New York Safety Engines.
One Small Upright Boiler, for making Steam for Exhauster.
One Hydraulic Main, with 6-in. Connections, for five benches of 5's, with 10-in. Outlet Connection.
One Hydraulic Main, with 4-in. Connections for four benches of 3's, with 4-in. Outlet Connections.
Four Purifiers, 10 x 12 x 3 ft. 15-in. Seal and 16-in. Connections. Dry Center Seal.
60-inch Station Meter and Stand (American Meter Co.); 8-in. Connections.
One Multituber Condenser, 16 x 4 x 4 in. Pipes. 16-in. Connections, with four-way Valves on Connections.
Two Scrubbers, 4½ x 4½ x 12 ft., with 10-in. Connections and four-way Valves on Connections.
Seven New Mouthpieces for 5's. Also,
Tools for Retorts, and **Connections** for five benches of 5's and four benches of 3's, with **Mouthpieces** for same.
For full particulars address DELA. COUNTY GAS CO.,
935-2 Chester, Pa.

A GOOD, SAFE INVESTMENT.

FOR SALE—Consolidated Gas and Electric Light Plants,

doing a good business in the best town in Southwest Missouri. For further particulars address Lock Box 593,
933-8 Fort Scott, Kansas.

BONDS FOR SALE.

A Gas Company with a first-class plant in a flourishing Ohio town have fifty-eight (58) Bonds, of five hundred ($500) each to put on the market. Bonds mature 1909, and bear 6 per cent. interest, payable semi-annually. Address
934-5 "1909," care this Journal.